

**REMARKS**

Claims 1, 2 and 4-11 are pending in the application and stand rejected. Claims 1 and 9 are amended, claim 3 is canceled. No new matter is added. In light of the foregoing amendments and the following remarks, Applicants earnestly solicit favorable reconsideration.

Applicants request an interview with the Examiner at his earliest possible convenience. Please see the attached Interview Request form.

**Specification:**

As a preliminary matter, Applicants have amended the specification to correct typographical errors.

**On the Merits**

**Claim Rejections - 35 U.S.C. §103**

Claims 1, 2 and 7 are rejected under 35 U.S.C. §103(a) as being unpatentable over IBM Technical disclosure (NB 8910242) in view of *Sugino* (Applicant's Admitted Prior Art) as evidenced by *Mandelman* (US 5,629,580).

**Independent Claim 1:**

Independent claim 1 requires in part:

a fine vacuum tube element and other electronic elements integrated and formed on a substrate of a semiconductor, the fine vacuum tube element and the other electronic elements transmitting signals to and from each other; wherein an interference system is constructed and an A/D converter is constructed.

The Examiner contends this new feature (formerly of claim 3) is disclosed by *Peczalski*, specifically in column 3, lines 50-70 and item 86 of FIG. 5. Here *Peczalski* discloses:

Channel balance control 76 is for fine adjusting the splitting of modulated laser signals for each of the inputs or arms of Mach-Zehnder interferometers forming A/D converter 80.

Thus, *Peczalski* may disclose an interference system as required by claim 1. However, *Peczalski* actually teaches away from combining it with the IBM reference. Specifically, in the Summary of the Invention, *Peczalski* states:

The basic invention is a translator or decoder wherein both the input and output signals are purely optical. **There is no electronic translation or conversion of signals within the converter....**Many other circuits may implement the present invention to attain the advantages of speed and refinement. Emphasis added.

Thus, *Peczalski* teaches only to use light in order to attain such high speeds, **not** electronic translation. Claim 1 does not mention using any light. In fact, claim 1 requires a vacuum tube element. A person having ordinary skill in the art would know that a vacuum tube is used for transmitting electrons, **not** laser light. In other words, the electron being emitted needs to have a vacuum in order to avoid being absorbed by any surrounding air.

Thus, Applicants submit that using laser light in a vacuum tube does not appear to be a logical conclusion. Thus, there is no apparent reason to combine the references.

Dependent Claim 2:

Regarding the dependency of claim 2 on claim 1, there appears to be even more reason not to combine the references. Specifically, claim 2 requires ballistic electrons (inside the

vacuum tube). Using a laser, as required in *Peczalski* is not the same as using ballistic electrons. Photons are not electrons.

Thus, the combination of references does not appear to disclose the claimed invention.

Dependent Claim 7:

Dependent claim 7 requires in part:

a thermionic cathode is used as a cathode of the vacuum element.

Without explanation, the Examiner contends this feature is disclosed in the IBM reference. Within the reference, Applicants could find no indication that the cathode used was of the thermionic variety. Cathodes may be of several types including: field emission cathodes and Schottky emission cathodes, or other cold-field emitters, to name a few.

As such, it does not appear that the Examiner has met the prima facie burden of showing obviousness. In order for the rejection to be proper, Applicants respectfully submit that the Examiner must indicate how the IBM reference shows a thermionic cathode, or why a person having ordinary skill in the art would use a thermionic cathode.

Claims 4-6 and 8-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Peczalski* (US 4,991,920) in view of IBM Technical disclosure (NB 8910242) / *Sugino* in further view of *Mandelman*.

Dependent Claim 6:

Dependent claim 6 requires in part:

wherein a sensor such as a magnetic/electric field sensor is constructed by utilizing a quantum effect of ballistically traveling electrons.

Although not specifically addressed by the Examiner, similar to the argument presented above regarding claim 1, the references when viewed individually or as a whole do not disclose a sensor constructed by utilizing a quantum effect of ballistically traveling electrons. *Peczalski* appears to disclose only using lasers, not ballistic electrons. As such, Applicants respectfully submit the Examiner's rejection of claim 6 is not appropriate.

Claim 8 stands rejected under 35 U.S.C. §103(a) as being unpatentable over NB (8910242) / *Sugino* as applied to claim 7 above, and further in view of *Dai et al.* (US 2001/0019238).

Dependent Claim 8:

Claim 8 requires a carbon nanotube to be attached to the thermionic cathode. The Examiner does not specifically address this feature and simply states that "carbon nanotube FEDs were well known in the art." The Examiner then states that "it would have been obvious to one of ordinary skill in the art at the time of the invention to have used a carbon nanotube gated FED."

However, no support is provided for this position. Claim 8 requires a "carbon nanotube be attached to the thermionic cathode." Applicants respectfully ask the Examiner to provide support for the rejection. As the Examiner has not yet shown this feature, Applicants respectfully submit that the rejection is improper for not meeting the prima facie burden of showing obviousness under 35 U.S.C. § 103(a).

Claims 4-6 and 8-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Soref* (US 5,838,870) in view of (NB 8910242) / *Sugino* in further view of *Mandelman*.

Independent Claim 1:

As the feature of claim 3 were amended into claim 1, Applicants address the rejection with respect to claim 1.

As indicated above, claim 1 requires an interference system and an A/D converter. The Examiner contends this is disclosed by *Dai* as noted in column 3. Here *Dai* discloses an “optical waveguide of this invention.” Column 3, lines 21 and 22.

As discussed earlier, claim 1 is directed toward electron emission (i.e. vacuum tubes). Using optical transmission for a Mach-Zehnder waveguide in a fine vacuum tube element would therefore not be obvious as the two methods are unrelated.

Thus, there is no motivation to combine the cited references. Furthermore, as *Dai* uses optics and the claimed invention uses ballistic electrons (required in claim 2) Applicants respectfully submit that the rejection is not proper.

Dependent Claim 6:

As discussed above regarding claim 1, *Dai* is concerned with using “ballistic electrons” to form a “sensor.” *Dai* is directed toward an “optical waveguide” as discussed previously. Thus, Applicants submit that the claimed invention is not disclosed or fairly suggested by the cited references.

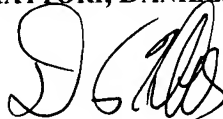
In view of the aforementioned amendments and accompanying remarks, Applicants submit that the claims, as herein amended, are in condition for allowance. Applicants request such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney to arrange for an interview to expedite the disposition of this case.

If this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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